



Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
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Ralph A. Dodds, III
Director, Nuclear Safety Assurance

April 8, 2013

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

SUBJECT: Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
Docket No.: 50-293
License No.: DPR-35

Licensee Event Report 2013-003-00, Loss of Off-Site Power Events Due to Winter Storm Nemo

LETTER NUMBER: 2.13.032

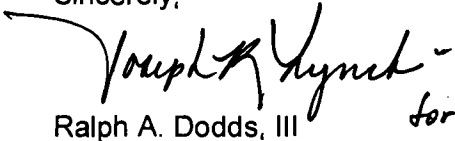
Dear Sir or Madam:

The enclosed Licensee Event Report (LER) 2013-003-00, "Loss of Off-Site Power Events Due to Winter Storm Nemo" is submitted in accordance with 10 CFR 50.73.


This letter contains no commitments.

Please do not hesitate to contact Mr. Joseph R. Lynch, (508) 830-8403, if there are any questions regarding this submittal.

Sincerely,


Ralph A. Dodds, III for

Attachment 1: Licensee Event Report 2013-003-00, Loss of Off-Site Power Events Due to Winter Storm Nemo (5 pages)

IE22
NRR 

cc:

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Pilgrim Nuclear Power Station

Attachment 1
Letter Number 2.13.032

Licensee Event Report 2013-003-00

Loss of Off-Site Power Events Due to Winter Storm Nemo

(5 Pages)

LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Service Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME

Pilgrim Nuclear Power Station

2. DOCKET NUMBER

05000293

3. PAGE

1 OF 5

4. TITLE

Loss of Off-Site Power Events Due to Winter Storm Nemo

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	RE V N O	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
02	08	2013	2013	003	00	4	08	2013	N/A	
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)							
N			<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)				
			<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(vii)(A)				
			<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)(B)				
			<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)				
			<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)				
			<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)				
			<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)				
10. POWER LEVEL			<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	OTHER Specify in Abstract below or in NRC Form 366A				
85%			<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)					

12. LICENSEE CONTACT FOR THIS LER

NAME

Joseph R. Lynch, Licensing Manager

TELEPHONE NUMBER (Include Area Code)

(508)-830-8403

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU- FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU- FACTURER	REPORTABLE TO EPIX
C	FK	XFMR	W120	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ Yes (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO15. EXPECTED
SUBMISSION
DATE

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On Friday February 8, 2013, at 2117 hours with the reactor initially at 85% core thermal power, Pilgrim Nuclear Power Station (PNPS) experienced a loss of off-site power (LOOP) resulting in a load reject and a reactor scram. All rods fully inserted and the Emergency Diesel Generators automatically started and powered safety-related buses A5 and A6. All other safety systems functioned as required. The plant stabilized in Hot Shutdown. At the time of the event a significant winter storm (Nemo) was buffeting Southern New England. At 2200 hours PNPS in conjunction with the local grid operator determined off-site power sources were not reliable and efforts to restore off-site power were temporarily suspended. At 2200 hours, PNPS declared a Notification of Unusual Event. On February 10, at 1055 hours, one of two off-site power supplies was restored, all safety buses were powered from the startup transformer and the Unusual Event was exited. Later on February 10, at 1402 hours with the plant in Cold Shutdown, ice bridging on a startup transformer insulator caused its 345 KV supply breaker to open resulting in a second LOOP. Again the EDG's started and powered safety-related buses. All other safety systems functioned as required. Shutdown cooling was restored at 1426 hours. On February 10, at 2020 hours, this occurrence was reported to the USNRC as documented in EN# 48739.

The severe winter storm which caused extensive generalized geographical damage to the electrical distribution network was root cause of the LOOP events.

These events posed no threat to public health and safety.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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Pilgrim Nuclear Power Station	05000293	YEAR	SEQUENTIAL NUMBER	REV NO.	2 OF 5
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NARRATIVE**BACKGROUND:**

Pilgrim Station is connected to the transmission lines through a 345KV ring bus located within the station's 345KV switchyard. The 345KV ring bus connects the output of the main transformer, the startup transformer (SUT), Line 355, and Line 342. There are four gas circuit breakers which comprise Pilgrim's 345KV ring bus: ACB-102, ACB-103, ACB-104 and ACB-105.

Line 355 is a two terminal line which connects Pilgrim to National Grid's Bridgewater Station and is connected to ACB-102 and ACB-105. Line 342 is a three terminal line, which connects Pilgrim to the Canal Power Plant's Switchyard in Sandwich, MA and to Auburn Street Station Switchyard in Whitman, MA. The Canal Switchyard is owned and operated by NSTAR and Auburn Street Station Switchyard is owned and operated by National Grid. Pilgrim's ACB-103 and ACB-104 connect Line 342 to the plant's switchyard. The 345KV system is the Pilgrim Station output power connection and is the preferred off-site power source via the SUT.

The 345KV ring bus design locates the power transmission lines such that a failure of any one line will not result in the loss of the other line. Specifically, with both transmission lines in service, a failure of either 345KV line will not result in a main generator trip, a SUT trip, or a failure of the other 345KV line. Either of the two 345KV lines is capable of carrying full station output and supplying station loads via the SUT.

The 345KV protective relay system is designed and coordinated to isolate system disturbances and minimize the impact to the overall transmission system. The protective systems are comprised of a primary and secondary protection scheme and are divided into four zones of protection.

- The main transformer (bounded by ACB-104 and ACB-105)
- The SUT (bounded by ACB-102 and ACB-103)
- Line 355 (bounded by ACB-102 and ACB-105 and Bridgewater Station)
- Line 342 (bounded by ACB-103 and ACB-104 and Auburn Street Station Street and Canal Stations)

When ACB-104 and ACB-105 open, the main transformer is isolated from the 345KV transmission system thus resulting in a generator full load reject event.

In addition to the preferred 345KV off-site power lines, Pilgrim has a secondary off-site power source, a 23KV line from NSTAR's Manomet Substation that provides power to a shutdown transformer (SDT).

During normal station start-ups and shutdowns, the station's 4160V demands are supplied by the SUT. Once the station main generator is synchronized to the 345KV transmission system, the station unit auxiliary transformer (UAT) supplies all station 4160V demands, with the SUT maintained in standby, ready to provide 4160V power if necessary.

In anticipation of a major snow storm impacting Pilgrim Station (PNPS) on February 8, 2013, Operations entered Procedure 2.1.37 (Coastal Storm Preparations). Procedure 2.1.42 (Operation During Severe Weather) and EN-EP-302 (Severe Weather Response, currently, EN-FAP-EP-010) at 0800 hours on February 7, 2013. At 1021 hours on February 8th, Station Risk was elevated to YELLOW due to the winter storm warning (severe weather). During the storm on February 8, meteorological instruments at PNPS recorded sustained wind speeds between 42 and 49 mph through 2338 hours at which time the plant information (PI) system stopped recording weather data until 1840 hours the following day. The wind direction was predominantly from the ocean toward the switchyard during the storm.

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EVENT DESCRIPTION:

On Friday, February 8, 2013, at 2018 hours, the shutdown transformer (SDT) was declared inoperable due to repeated off-site 23KV Trouble/Trip Bypass alarms and reports from NSTAR regarding the power loss and restoration events on the Line via the Manomet Substation.

On February 8th, two line faults occurred on both 345KV transmission lines connected to the PNPS ring bus. At 2102 hours a major fault occurred on off-site Line 342 which remained de-energized for the remainder of the storm. At 2117 hours a fault on Line 355 occurred resulting in a full load reject of the PNPS generator, a subsequent reactor scram, and loss of the SUT. Emergency diesel generators (EDGs) automatically started and provided power to safety buses A5 and A6. Groups I, II, and VI isolations went to completion. Reactor Core Isolation Cooling (RCIC) system was placed in service to maintain reactor vessel water level. High Pressure Coolant Injection (HPCI) system was placed in service to control reactor pressure. All systems performed as designed to bring the reactor to Mode 3, including initiation of reactor water cleanup isolation, reactor building isolation system, and standby gas treatment system.

At 2200 hours, an Unusual Event was declared (EAL SU 1.1) for loss of off-site power to Emergency Busses.

At 2211 hours, off-site line 355 was restored and ACB-102 was closed manually to reenergize the SUT.

At 2340 hours, a 'B' phase fault on the SUT bus work tripped the SUT bus lockout relay. Walkdowns of the switchyard were conducted by Maintenance and Engineering to assess the condition of the SUT bus. The relays that initiated the bus trip indicated the fault was within the SUT protection scheme, but external to the SUT. Breaker ACB-102 was closed at 1809 hours on February 9th.

At 0813 hours on February 9th, NSTAR reenergized Line 355 and the SUT was energized and non safety related buses A1, A2, A3, A4 were energized from the SUT commencing at 1815.

At 0400 on February 10, off-site power was restored to safety-related 4160V bus A5 through the SUT via a single 345KV line. At 0830 hours, off-site power was restored to safety-related 4160V bus via A6 through SUT. The EDGs were secured and were on standby. Residual heat removal was in shutdown cooling mode maintaining the reactor in cold shutdown. Fuel pool cooling was in service with fuel pool temperatures trending down.

Effective at 1055 hours on February 10, 2013, Pilgrim terminated the Unusual Event and transitioned to recovery.

At 1401 hours on February 10th, with all control rods fully inserted and the reactor in cold shutdown conditions, the plant experienced a second loss of off-site power with a flashover fault on the B phase bus work of the SUT due to salt contaminated ice bridging on the phase insulator. This resulted in the tripping of the breaker ACB-102 and loss of power to 4160V busses. Both EDGs auto-started as designed and provided power to the emergency buses. This loss of off-site power resulted in de-energization of both reactor protection system (RPS) channels resulting in a reactor scram signal and loss of Shutdown Cooling. At 1426 hours, Shutdown Cooling was returned to service. All other plant systems responded as designed. Station personnel established back-up power to A5 and A6 buses in accordance with plant procedures. On February 12, at 0405 hours off-site power was restored to the non safety buses via the Main/ Unit Aux Transformers. At 0601 hours on February 12th, off-site power was restored to safety bus A6 through the Main/Unit Aux Transformers. Off-site power was restored to all 4160V buses through the SUT as of 2147 hours on February 12. The plant returned to power operation on February 15, 2013.

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CAUSE:

The coincident loss of transmission Lines 342 and 355 from faults external to the Pilgrim Nuclear Power Station switchyard due to the winter storm resulted in the loss of offsite power, full load rejection, and reactor scram. The subsequent flashovers in the switchyard were due to snow and ice buildup on insulators and electrical distribution components.

CONTRIBUTING CAUSES:

PNPS procedure 2.1.42, Operation During Severe Weather, provides limited guidance for Operations to determine which severe snow storms are most likely to challenge Pilgrim switchyard reliability.

Corrective actions to preclude recurrence taken in response to prior LER 2008-006-00 and LER 2008-007-00, Loss of SUT on line 355 flashover and ACB-105 flashover, and plant trip did not prevent recurrence.

Previously identified internal Operating Experience (OE) was not successfully utilized to direct the removal of snow and ice from insulators on the SUT prior to reenergizing.

CORRECTIVE ACTIONS:

The following corrective actions were completed to address the LOOP and flashover events prior the restart of Pilgrim Station:

The component of the capacitor coupled voltage transformer (CCVT) that was damaged due to the flashover fault was repaired.

Pilgrim reviewed LOOP events with NSTAR to improve reliability of service to the SUT.

Additional corrective actions included in the corrective action program are as follows:

- Procedural guidance containing a systematic process for removal and restoration of bus sections during and following blizzard conditions will be developed and implemented. This includes all 345KV and 23KV power lines.
- Procedural guidance for de-icing insulating material susceptible to a flashover event in the switchyard following blizzard conditions will be developed and implemented.

SAFETY CONSEQUENCES:

The Loss of Off-Site Power (LOOP) event is analyzed in the Updated Final Safety Analysis Report (UFSAR) and assumes loss of both 345 KV and 23 KV (preferred and secondary) sources coincident with a design basis accident (DBA). The design imposes a 10 second delay in re-energizing the 4160V Emergency Buses required to mitigate the DBA. In cases where coincident loss of an EDG presents a bounding condition, the affected safety bus is not assumed to be picked up by the shutdown transformer (SDT). The bounding condition in which all off-site power and onsite AC (EDGs) sources would be lost is a Station Blackout (SBO) transient event (10 CFR 50.63). Pilgrim is designed to recover from the SBO event by having a separate SBO diesel generator capable of providing power to the required safety buses to shutdown the plant and maintain it in a safe condition. Thus, the LOOP events experienced by Pilgrim are within the analyzed conditions and plant systems responded as designed.

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During and following the storm, operators were able to maintain safe shutdown conditions (reactivity control, reactor water inventory, decay heat removal, etc.). While loss of power to non-safety related spent fuel cooling was a key consideration, time-to-boil never became an overriding concern with respect to reenergizing buses and there was no freshly discharged spent fuel in the pool. The most recent freshly discharged fuel was almost 23 months old, and the time to boil was approximately seven days upon loss of fuel pool cooling. The spent fuel pool temperature was less than 105 degrees F.

The EDGs started and loaded as expected following each loss of SUT event. The amount of fuel onsite initially was sufficient to operate the EDGs for 7 days (under LOCA conditions) and the SBO DG was always available.

Based on the challenge to safety systems during and following the event, Conditional Core Damage Frequency (CCDF) of the event was estimated to be 1.8E-5.

Throughout these events there was no adverse impact on the public health and safety.

PREVIOUS EVENTS:

The most recent LOOP events at Pilgrim Station reported as LER are as follows:

LER 2008-006-00, Automatic Scram Resulting from Switchyard Breaker Fault During Winter Storm, dated February 12, 2009.

LER 2008-007-00, Momentary Loss of all 345KV Off-Site Power to the Startup Transformer from Switchyard Breaker Fault, dated February 12, 2009.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIIS) CODES:

COMPONENTS	CODES
Transformer (Startup AC) Bus	XFMR

SYSTEMS

Switchyard System (Startup Transformer)	FK
ESF Actuation (RPS, PCIS, RBIS)	JE
Main Generator Output Power System	EL
Medium Voltage Power System- Class 1E (4KV)	EB

REFERENCES:

Condition Report CR-PNP-2013-0798, Loss of Off-Site Power